VOL. 1. OCTOBER, 1928 NO. 4.

Journal
OF THE
Kansas Entomological Society

PUBLICATION COMMITTEE

P. B. LAWSON, Chairman, Lawrence
J. W. McCOLLOCH, Editor, Manhattan H. H. NININGER, McPherson
W. KNAUS, McPherson HAZEL E. BRANCH, Wichita

Subscription, $1.00 per year **Single copy, 40 cents**

CONTENTS **Page**

THE USE OF VOLCK AGAINST EXTERNAL PARASITES OF DOMESTIC ANIMALS,—WESLEY G. BRUCE 74
THE LIFE HISTORY OF ERYTHRONEURA ZICZAC WALSH (Homoptera, Cicadellidae.),—VERA M. FAIRBAIRN . . . 79
THE GENUS HYMETTA (Homoptera, Cicadellidae),—VERA M. FAIRBAIRN 84
THE MUTILLIDAE OF KANSAS.—J. W. McCOLLOCH . . 93
COLLECTING NOTES ON COLEOPTERA.—W. KNAUS . . 98
NOTES 99
ANNOUNCEMENT 100

JOURNAL OF THE KANSAS ENTOMOLOGICAL SOCIETY

Publication Office, 119 South Main Street, McPherson, Kansas, W (arren) Knaus, Publisher

A quarterly journal published in January, April, July and October, devoted to entomology in Kansas and to the proceedings of the Kansas Entomological Society.

The subscription price is one dollar a year payable in advance. Single copies may be had at forty cents.

Manuscripts for publication may be sent to any one of the publication committee.

Subscriptions should be sent to the office of Publication, 119 South Main Street, McPherson, Kansas.

Entered as second-class matter December 31, 1927 at the Post-Office at McPherson, Kansas, under the Act of August 24, 1912.

THE USE OF VOLCK AGAINST EXTERNAL PARASITES OF DOMESTIC ANIMALS*

by

WESLEY G. BRUCE, Manhattan, Kansas

The white oil emulsion known as Volck has been used extensively as an insecticide on greenhouse plants and various fruit trees, including the citrus. The success of Volck in this field led the manufacturers to believe that there was a possibility that it would prove efficient against certain external parasites of domestic animals. Accordingly in June, 1927, an investigation was started under the administration of the Crop Protection Institute to determine the insectidical value of this material against the various insects and mites which affect livestock. The experimental phases of the work were outlined by Dr. F. C. Bishopp of the Bureau of Entomology, United States Department of Agriculture, and were carried out under the immediate supervision of Dr. R. C. Smith of the Department of Entomology, Kansas State Agricultural College.

It is my pleasant duty to offer my sincere thanks to Dr. R. C. Smith for his timely and valuable counsel; to Prof. Geo. A. Dean, Dr. F. C. Bishopp, Dr. E. J. Frick, Prof. J W. McColloch, Prof. E. V. Floyd, Dr. H. W. Brubaker, Dr. R. H. Painter, and Mr. H. R. Bryson, for their many helpful suggestions, and to my colleagues A. I. Balzer and C. B. Wisecup for their friendly cooperation.

The primary object of this investigation was to determine the insecticidal value of Volck against certain insects and mites, which infest domestic livestock. If found to be adapted to such usages, it was planned to determine the most effective methods of application, both as to means and the interval between applications.

*Contribution No. 371, Department of Entomology, Kansas Agricultural Experiment Station. This paper is an abstract of a thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in the graduate school of the Kansas State Agricultural College in 1928. These studies have been carried out in connection with the project on insecticidal possibilities of the white oil emulsion known as Volck, administered by the Crop Protection Institute with funds supplied by the California Spray-Chemical Company.

NATURE OF VOLCK

Volck is a product of the California Spray-Chemical Company. According to H. E. Woodworth, assistant general manager of the company, "Volck is an emulsion of white oil and differs from ordinary oil emulsion in the relative purity of the oil." It is pure white in color and has the consistency of a thick cream. A newly opened can of Volck has a faint odor of ammonia. Solutions of 10 per cent or less break down in a few days and cannot be brought back to their original form. Volck mixes readily with both hard and soft water, and adheres very well to the hair of animals. In no instance has this material had any harmful effect upon livestock. Dogs and chickens have been permitted to drink a ten per cent solution of Volck, and Dr. E. J. Frick administered a one ounce capsule of undiluted Volck to a dog without notice able effect upon the animal.

A type of Volck, designated as special emulsion No. 2, has been used for all of these tests unless otherwise noted. Mr. Woodworth states "The oil is the same as in all our samples, and it is called Special Emulsion because the emulsifier has been changed in order to do away with any possible irritation."

It is not known exactly how Volck kills insects, but presumably it is largely by the stoppage of the spiracles. However, this does not explain entirely the rapidity with which oils of this type work.

GENERAL METHOD

Tests were made as often as experimental animals could be obtained and the weather was favorable. Fifteen species of insects and mites affecting cattle, horses, asses, swine, poultry, cats, dogs and man were used in these tests. The following discussion gives the amount of Volck used, the method of application and the results obtained for each parasite studied.

CONTROL OF POULTRY LICE.

One hundred eighty-six chickens infested with the large hen louse **Goniocotes obdominalis** Piaget; the body louse, **Menopon biseriatum** Piaget; and the shaft louse, **Menopon pallidum** Nitzsch, were used in these tests. The method of applying Volck was by dipping the birds in a four-gallon tub of the solution. The birds were

immersed, the solution worked into the feathers with the fingers and the head of the bird submerged two or three times. A seven per cent solution was effective against these lice.

CONTROL OF TROPICAL FOWL MITE

Only two birds could be found infested with the tropical fowl mite, **Liponyssus bursa** Berlese. An 8 per cent solution of Volck was applied as a dip, the material being worked into the feathers with the fingers. The birds were examined daily for twelve days after treatment and no live mites were found.

CONTROL OF POULTRY MITES

Solutions of 50 per cent and 60 per cent Volck were used in four poultry houses infested with common poultry mites, **Dermanyssus gallinae** Redi. The solution was applied with a compressed air sprayer. The size of the spray cone was lessened by a specially prepared spray disk which afforded less waste and greater force. With heavy infestations, the spray was repeated in ten days. Before spraying, all roosts were loosened and trash removed in order to afford complete coverage. No live mites were found after treatment.

CONTROL OF FLEAS.

Twenty-three dogs and cats were used in tests with Volck against fleas, **Ctenocephalus canis** Curtis, and **Ctenocephalus felis** Bouche. Various dilutions of from 5 per cent to 10 per cent were used. The solution was applied as a spray to the larger animals and as a dip to the smaller animals. Examinations were made at frequent intervals to ascertain the percentage of kill of the fleas and the condition of the animals. A 10 per cent solution of Volck was effective against fleas.

CONTROL OF HOG LICE

An 8 per cent solution of Volck was used on thirty-eight hogs infested with **Haematopinus suis (Linn.)** The solution was applied with a compressed air sprayer. Satisfactory results were recorded.

CONTROL OF CATTLE LICE

Various dilutions of from 8 per cent to 10 per cent were used as a spray for the long-nosed ox louse, **Lino-**

gnathus vituli (Linn.) and biting louse, **Trichodectes scalaris** Nitzsch, the former being found on calves and the latter on cows. Eighteen animals were used in these tests. The solution of Volck was applied with a compressed air sprayer having a specially designed spray, disk that afforded deeper penetration and greater concentration of the spray material. Most of the animals were examined daily for a period of ten days to note the percentage of kill and the effect of the material on the animal. A 10 per cent solution was effective against the sucking lice and an 8 per cent solution was effective against the biting lice with no harmful effect upon the animals.

CONTROL OF LICE ON ASSES

A jack and two jennets were heavily infested with biting lice, **Trichodectes parumpilosis** Piaget and sucking lice, **Haematopinus asini** (Linn.). Solutions of 8 per cent and 10 per cent were used on these animals, the material being applied with a compressed air sprayer and worked into the hair with the fingers and a brush. The animals were examined daily for three days and no live lice were found.

CONTROL OF HORSE BOTS

Undiluted Volck was applied with a rag to the eggs of botflies, **Gastrophilus intestinalis** De Geer, on the legs of horses. After six days the eggs were artificially hatched with a needle and moisture as were the untreated eggs and the mortality noted. After applying Volck, the hair bearing the eggs was clipped off, both on the treated and untreated areas, and kept in open dishes for six or seven days. This was done because flies would continue to deposit eggs on the treated areas and an accurate test could not be made. Volck gave very satisfactory results against the eggs of bot flies.

CONTROL OF HEAD LICE

Only one opportunity presented itself for the use of Volck against head lice, **Pediculus capitis** De Geer. Four Mexican children attending a grade school, were found to have head lice. The heads of these children were very clean but each had ten or more lice. A 10 per cent solution of Volck was applied as a head wash. Results were checked the following day by combing the

hair with a fine comb. Fairly good results were obtained.

CATTLE GRUB

Fifty per cent Volck was applied to sixty-nine cattle grubs on six cows. The application was made with an oil can with a slender spout, and approximately 1 c. c. of the material injected into each cyst. Six or seven days after treatment, the grubs were expelled by hand, and the condition of the cysts and skin around them noted. Volck had no noticeable effect upon the grubs.

SUMMARY.

The writer does not consider this work as conclusive and further research work is regarded as desirable to verify the results obtained here. A larger number of animals should be treated before Volck can be recommended as an efficient insecticide against the external parasites of domestic animals. The results of the writer's experiments are summarized as follows:

1. A 7 per cent solution of Volck when applied as a dip and thoroughly worked into the feathers, was effective against the common lice of poultry.
2. An 8 per cent solution of Volck killed all the tropical fowl mites on two roosters.
3. A 50 per cent solution of Volck when applied as a spray, was effective against the common poultry mite.
4. A 10 per cent solution of Volck, thoroughly applied as a spray or dip, eliminated the fleas from dogs and cats when the animals were kept away from flea infested quarters.
5. An 8 per cent solution of Volck applied as a spray gave satisfactory results against hog lice.
6. An 8 per cent solution of Volck when applied as a spray and thoroughly worked into the hair was effective against the biting lice of cattle.
7. A 10 per cent solution of Volck applied as a spray gave satisfactory results against the long-nosed ox-louse of cattle.
8. An 8 per cent solution of ordinary Volck and a 10 per cent solution of special emul-

sion killed all the lice on three asses.

9. Undiluted Volck gave satisfactory results against the eggs of bot flies on horses.
10. A 10 per cent solution of Volck gave fairly good results against the head lice of man.
11. A 50 per cent solution of Volck, injected into the cyst of the ox-warble, had no noticeable effect upon the warble.
12. Volck was absolutely harmless to the animals and chickens treated in these experiments.
13. Volck produces a fine coat of hair on dogs, cats, cattle and horses.

THE LIFE HISTORY OF ERYTHRONEURA ZICZAC WALSH (Homoptera, Cicadellidae.)*

by

Vera M. Fairbairn, Lawrence, Kansas.

Walsh (1), who first described this species of leafhopper, stated that it occurred abundantly on grape vines. Gillette (2) reports the occurrence of this species in large numbers on Virginia creeper **(Parthenocissus quinquefolia,)** and occasionally on grape. Robinson (3) reports it on grape, Virginia creeper, and Boston ivy **(Parthenocissus tricuspidata).** This species appears to have an especial preference for Boston ivy. Virginia creeper is next in order of preference, and grape is used as a host plant only when Boston ivy and Virginia creeper are not available. The following observations were all made on Boston ivy.

Oviposition.

The eggs are deposited just beneath the epidermis on the lower surface of the older leaves. They are covered with a bluish-grey deposit which makes their presence more noticeable. They are laid in groups or singly, the majority of them being laid near the base or center of the leaf. Most of the eggs are laid in groups. (Table 1.)

*Contribution from the Department of Entomology, University of Kansas.

Table I, Showing Number of Eggs in a Group.

Number of Eggs in Group	1	2	3	4	5	6	7
Number of Groups Observed	12	35	42	23	14	7	2

As shown from the above, eggs are frequently laid singly. The highest number of eggs found in a group was seven. The average number of eggs in a group, as ascertained by the observation of 135 groups was 3.15 eggs.

The exact date of the oviposition of the first eggs for the first generation was not observed, but on May 19, 1927, when the first observations were made, many eggs were found, although none had yet hatched. Oviposition for the first generation was continued to about the 21st. day of June.

Preoviposition Period.

The average preoviposition period was 5.15 days. The minimum preoviposition period was 3 days and the maximum preoviposition period 6 days. (Table II.)

Table II.—Preoviposition Period.

Cage Number	1	2	3	4	5	6	7	8	9	10	11	12	13
No of Days	6	6	3	5	4	4	5	5	6	6	6	6	5

This information was obtained by placing six adults that emerged on the same day in a cage, on a leaf known to contain no eggs. This leaf was examined each day to see if any eggs were laid. The length of the preoviposition period was obtained by counting the number of days between the placing of the newly-emerged adults in the cage, and the day when the first eggs were found.

Hatching.

From 20 to 30 minutes elapse between the moment the head begins to break through the shell of the egg and the moment when the nymph is completely free of the egg. The nymph comes out head first, wiggling the abdomen around and gradually working itself out of the shell. The legs and antennae are folded against the under side of the abdomen as the nymph comes from the shell. Eye spots begin to appear in the eggs about the seventh day. Practically 100 per cent of the eggs for the first generation were fertile. However, the second and third generation eggs were only about 50 per cent fertile.

The Nymphs.

The nymphal period is passed on the under surface of the older leaves. The young move about but little during the developmental period, remaining for the most part on the leaves on which they were hatched. They occasionally move to the upper surface of the leaf but it is very seldom, and they never feed there. In common with most leafhoppers, **Erythroneura ziczac** passes through five nymphal instars.

The life history was obtained in the following way: A Boston ivy leaf was placed in a small bottle of water, and the neck of the bottle was plugged up with cotton. A newly hatched nymph was then placed on the leaf and the length of time between molts, changes in color, etc. were observed. In practically every case the leaf stayed fresh for the entire length of the developmental period and it was not necessary to transfer the insect to a fresh leaf.

Nymphal Period of First Brood

The first nymph of the first brood hatched on May 23, and the last nymph of the first generation became an adult on July 7. The length of the nymphal instars for the first-brood individuals in 1927 is shown in Table III.

Table III—Length of nymphal period, first brood.

		Length of instar in days		
Instar	No. Individuals	Average	Maximum	Minimum
First	15	3.6	6	3
Second	26	3.1	4	2
Third	41	2.9	4	2
Fourth	47	2.9	5	2
Fifth	51	4.2	6	2

Appearance of Adults

The first adult of the first brood emerged on June 14, 1927 and the last one on July 7, 1927.

Period of Incubation of Second Brood.

The first eggs for the second generation were laid on June 25, and the last eggs for the second generation were laid on July 12. The average duration of the egg

stage for the second generation was 8.1 days. The greatest number of days required for the incubation of the second generation eggs was 10 days ,while the minimum number of days required was seven days. The above figures were obtained from the observation of 113 eggs. The first second generation nymph hatched on July 4 and the last one hatched on July 21st.

Nymphal Period of second Brood.

The first nymph of the second generation hatched on July 4 and the last nymphs of the second generation emerged as adults on August 12, making the entire length of time between the hatching of the first nymph and the emerging as adult of the last one, 39 days. The amount of time required for the development of the second brood ranged from 13 to 19 days with an average of 15.37 days. The length of the nyphal instars for the second brood individuals in 1927 is given in Table IV.

Table IV—Length of Nymphal period, second brood.

		Length of instar in days		
Instar	No. Individuals	Average	Maximum	Minimum
First	67	2.86	4	2
Second	65	2.69	4	2
Third	60	2.50	4	2
Fourth	58	2.81	4	2
Fifth	56	4.46	6	3

Period of Incubation of Third Brood

The first eggs for the third generation were laid on July 25 and the first nymphs hatched on August 2. The average duration of the egg stage for the third generation was 9.08 days. The greatest number of days required for the incubation of the third generation eggs was 10 days, while the least time was 8 days. The above average was obtained from the observation of 25 specimens.

Nymphal Period of Third Brood.

The first nymphs of the third generation hatched on August 2nd. The length of only the first and second instars was observed for this generation. The average length of the first instar was 4 days. The greatest length

of this instar was 5 days; while the minimum length was 3 days. These figures were obtained from the observation of 11 specimens. The average length of the second instar was 3.14 days. The maximum length of the second instar of those observed was 4 days; while the minimum length was 3 days. The figures for the second instar were obtained from the observation of 7 specimens. The first adult of the third generation emerged on August 21st. On August 26th, there were a great many adults on the ivy out of doors—more than there were for either the first or second generation.

Number of Generations.

There are certainly three, and doubtless four generations of **Erythroneura ziczac** in the latitude of Kansas. On September 3rd. some eggs were found out of doors on the Boston ivy. There were at that time many adults on the ivy. On September 15th, a great many adults (third generation, presumably) were found, and also some, third, fourth and fifth instar nymphs (fourth generation, presumably). On September 19th, there were still many adults present and a few fourth and fifth instar nymphs. On September 22nd. there were more adults than ever before, so it is probable that most of the fourth generation nymphs had become adults. However, on September 27th there were still a few fifth instar nymphs present.

Hibernation.

The adults were very numerous from that date until October 22nd., when the first ones went into hibernation under leaves and rubbish. Practically all of them had gone into hibernation by October 29th. It is quite probable that, because of the peculiarly warm fall, they had gone into hibernation somewhat later than they would have had it been a cooler fall.

Character of The Injury.

Both the nymphs and the adults reduce the functional leaf surface by the removal of chlorophyll. This weakens the plant and checks its growth. The presence of **Erythroneura ziczac** may be recognized by the mottled appearance of the leaves. Tiny, pale yellow spots will be noticed and, if numerous enough, they give the

entire leaf a yellowish appearance. In severe infestations the leaves dry up and the decorative value of the vine is greatly reduced. Many times there is severe defoliation of the Virginia creeper.

Bibliography.

(1). **Erythroneura ziczac** Walsh. The Prairie Farmer (Illinois), No. 10, p. 149; 1862.
(2). **Typhlocyba comes** var **ziczac** Gillette. Proc. U. S. Nat. Mus., p. 761; 1898.
(3). **Erythroneura ziczac** Robinson. Kan. Uni. Sci. Bul., XVI, p. 135; 1926.

THE GENUS HYMETTA (Homoptera, Cicadellidae)*

by

Vera M. Fairbairn, Lawrence, Kansas.

The genus **Hymetta** was erected by McAtee (1) in 1919 to accomodate the species **trifasciata** which Say, in 1825, described and placed in the genus Tettigonia. McAtee credited his new genus with a single species, **trifasciata,** having four varieties, var. **trifasciata** Say, var **balteata** McAtee, var. **albata** McAtee, and var. **anthisma** McAtee. The results of this study show that we now have five species and two varieties.

DESCRIPTION OF THE GENUS.

McAtee, in erecting the genus, gives the following generic description:

Tettigonia trifasciata Say differs from other species of the genus **Erythroneura** Fitch, and indeed from all members of the family, so far as I am aware, in having the scutellum thickened and distinctly elevated apically. Seen from the side the dorsal outline is conspicuously interrupted by the prominent scutellum in this species; in others it is smooth. This notable difference in structure is accompanied by less important variations in venation which in themselves make it undesirable to retain the species in **Erythroneura.** The second apical vein is curved, reaching margin at exterior angle of tegmen, and not infrequently it nearly or quite forms a stalk with first

*Contribution from the Department of Entomology, University of Kansas. 1. Proc. Biol. Soc. Wash., Vol. XXXII; pp. 121-124, 1919.

apical vein. In typical **Erythroneura,** the second apical vein clearly reaches the posterior margin of tegmen, and rarely, if ever, is united in a stalk with first apical vein. Both the fore and hind wings of this genus are broader than those possessed by most of its relatives; the hind wings being particularly ample. The most common color forms of the genus have these broad wings milky-white with the head and thorax shaded from ivory color to reddish-brown. The fore wings are delicately marked with smoky to black, and orange to scarlet markings.

The writer gives the following generic description:

FORM.—Head slightly narrower than pronotum. Vertex distinctly produced medially, almost twice as long at the middle as next the eyes, about as long as broad. Front broad basally, much narrowed apically. Pronotum not quite twice as wide as long, anterior margin always more curved than posterior margin; lateral and humeral margins distinct. Scutellum finely granular and with distinct impressed line; distinctly elevated caudad of impressed line. Tegmina moderately long, only slightly narrower basally and apically than in median area. Venation distinct. Four apical cells present.

EXTERNAL GENITALIA. Female: Last ventral segment extremely produced medially, over twice as long as preceding one; produced apex bearing no median notch. Pygofer stout, sparsely spined, exceeded by the ovipositor. Male:—Last ventral segment long, hiding the valve. Plates long and slender, longer than last ventral segment, their sides straight to the somewhat narrowed apices. Pygofers long, exceeding plate by about one-half the length of the latter, bearing spines on lateral margins.

COLOR.—Head varying from milky-white to yellowish-brown, reddish to orange markings sometimes present. Eyes dusky to black. Pronotum milky-white to brown, bright red markings or brownish areas usually present. Black spot always present at apex of elevated scutellum. Remainder of scutellum milky-white to light brown. Tegmina white to cream colored background; always a fairly distinct dusky to bright red transverse band just caudad of apex of scutellum (Crossband I); frequently a less distinct dusky to red interrupted transverse band just cephalad of cross-veins (Crossband 2); often a dusky oblique band across the apical

cells (Crossband 3). A black dot on corium near or touching claval suture at a point a little more than half way to apex of clavus. Orange to scarlet dots and flecks on corium and clavus cephalad of transverse veins. Costal plaque milky-white except in **kansasensis.**

KEY TO SPECIES.

1. Crossband 1 strongly narrowed on costal margin....2
   Crossband 1 at most but slightly narrowed at costal margin 4
2. Costal plaque dark .....**kansasensis** sp. n.
   Costal plaque not dark.....3
3. Apex of scutellum with large black spot.....
   .....**arizoniana** sp. n.
   Apex of scutellum with normal black spot....
   .....**trifasciata** (Say)
4. With distinct transverse band on apex of wing; posterior margin of crossband 1 running practically straight across to dark spot near claval suture
   ..... **distincta** sp. n.

   With transverse band at apex of wing at most indistinct; oblique band at apex of wing frequently distinct; posterior margin of crossband 1 projecting caudad close to dark spot near claval suture
   .....**balteata** McAtee

McAtee recognized one species, **Hymetta trifasciata** (Say.) and described three varieties: var. **balteata,** var. **albata, and** var. **anthisma.** Thus up to the time that the writer undertook this study, one species and three varieties were recognized as comprising the membership of the genus. The present work embodies a study of the inner male genitalia as well as of color pattern. The characters presented by the genitalia were constant within the species and were found to correlate with the color patterns. As a result of this study, the writer feels justified in (1) raising McAtee's variety **balteata** to specific rank and in considering **anthisma** as its variety; (2) sinking the variety **albata** as a teneral form; (3) describing a new variety of **balteata**—the variety **mediana;** and (4), describing three new species, **kansasensis, distincta,** and **arizoniana.** This classification agrees with the results of an examination of McAtee's types by Dr. Paul B. Lawson.

Hymetta trifasciata (Say).

(Plate I, Figs. 5, 8; Plate II, Figs. 3, 3a.)

Tettigonia trifasciata Say. Journ. Acad. Nat. Sci., Phila., Vol. IV, pp. 344-345; 1825. Reprint, Complete Writings, Vol. II, pp. 259-260; 1859.

Hymetta trifasciata var **trifasciata** McAtee. Proc. Biol. Soc. Wash., Vol. XXXII, pp. 121-124; 1919.

The following is Say's original description:

Tettigonia trifasciata—Pale yellowish-white; elytra irrorate with reddish and somewhat trifasciate with dusky.

Inhabits Missouri.

Body pale yellowish-white: head with two or three obsolete dull sanguineous spots on the vertex in the form of curves or circles; eyes dusky, thorax, a sanguineous line abbreviated before, and an obsolete curve at the anterior angle: hemelytra whitish, irrorate with sanguineous; a dilated, brownish, interrupted, subbasal band; an obsolete interrupted band behind the middle, upon the posterior costal termination of which is an abbreviated sanguineous line, and an oblique blackish band near the tip; a large quadrate white immaculate spot on the middle of the costal margin; humeral base white, immaculate; tegmina dusky at base; feet white. Length to the tip of the hemelytra one-eight of an inch. The spots of the head and thorax are sometimes hardly discernible, and the intermediate band is often so faint and interrupted as to be overlooked.

The following is the writer's description:

Length 3 to 3.5 mm. Average length 3.2 mm.

Head and pronotum as in other members of the genus. Tegmina milky-white with crossband 1 distinctly narrowed near costal margin; costal plaque chalky-white. Crossband 2 clearer than in other species. Flecks and dots over clavus and corium few in number and relatively pale in color. The members of this species are, on the average, smaller than the members of any of the other species of the genus.

Hymetta distincta sp. n.

(Plate I, fig. 6; Plate II, figs. 5. 5a.)

Length 3.3 to 3.5 mm. Average length 3.4 mm.

Head and pronotum as in other members of the

genus. Tegmina milky-white. Crossband 1 most outstanding in this species, not extending caudad of black spot on corium as a rule, the portion nearest costal margin much darker than remainder of crossband. Crossband 2 obsolete. A dusky transverse band across apex of wing; oblique band at apex of wing usually absent, or at most, very indistinct.

Holotype, male, Douglas Co., Kansas ,taken by Paul B. Lawson.

Allotype, female, Douglas Co., Kansas, taken by R. H. Beamer.

Numerous paratypes from eastern Kansas. All types in Snow Entomological Collection.

KEY TO VARIETIES OF BALTEATA:

1. Oblique band at tip of wing not present, or at most, indistinct; first crossband dusky to black in color .....var. **balteata** McAtee
   Oblique band at tip of wing distinct.....2
2. Crossband 1 brilliant scarlet....var **anthisma** McAtee
   Crossband 1 dull red in color....var. **mediana** var. n.

Hymetta balteata McAtee.

(Plate I, fig. 2; Plate II, figs. 1, la)

Hymetta trifasciata var. **balteata** McAtee.. Proc. Biol. Soc. Wash., Vol. XXXII, pp. 121-124; 1919.

The following is the original description:

Besides crossband 2 being obsolete, the red markings on head and thorax usually are lacking, these parts of body being ivory color, often shading into reddish-brown anteriorly. Otherwise the markings are those typical of the species.

The following is the writer's description:

Length 3.3 to 3.6 mm. Average length 3.4 mm.

Head and pronotum as in other members of the genus. Tegmina milky-white; crossband 1 dusky to black, darker near costal margin, posterior margin extending caudad of black spot on corium; crossband 2 obsolete; oblique band at tip of wing not present, or at most, indistinct. Relatively few red dots and flecks over clavus and corium. This form closely resembles **distincta** but can usually be readily distinguished from it by the fact that in this species crossband 1 extends caudad of

black spot on corium while in **distincta** it runs practically straight across and does not project caudad of this spot.

Hymetta balteata var. **anthisma** McAtee

Plate I, fig. 4)

Hymetta trifasciata var. **anthisma** McAtee. Proc. Biol. Soc. Wash., Vol. XXXII, pp. 121-124; 1919.

The following is the original description:

The most richly colored variety: the tegminal maculae scarlet; crossband 1 dull crimson darker edged; and crossband 2 varying from orange to scarlet. The markings on head and thorax which are red in the typical variety are pale yellow or wanting in this variety; one specimen has a median orange vitta abbreviated in front, on pronotum.

The writer gives the following description:

Length 3 mm.

Head and pronotum as in other members of the genus. Tegmina milky-white to cream colored. Crossband 1 brilliant scarlet, posterior margin extending distinctly caudad of black spot on corium; second transverse band orange in color and quite distinct; oblique band present but more smoky than black. In this species, the flecks and dots over the clavus and corium are much larger, brighter in color, and more numerous than in any other members of the genus.

Hymetta balteata var. **mediana** var. n.

(Plate I, fig. 3).

Length 3.3 to 3.5 mm. Average length 3.4 mm.

Head and pronotum as in other members of the genus. Tegmina milky-white to cream color. Crossband I dark red in color, projecting caudad of black spot on corium; crossband 2 quite distinct, orange to reddish in color; oblique band at tip of wing dusky to black. Dots and flecks on clavus and corium darker red than in **anthisma.**

Holotype, female, Douglas Co., Kansas. Taken by R. H. Beamer.

Allotype, male Douglas Co., Kansas. Taken by R. H. Beamer.

Numerous paratypes from eastern Kansas. All types in Snow Entomological Collection.

Hymetta arizoniana sp. n.

(Pl. I, figs. 1, 9; Plate II, figs. 4, 4a)

Length 3.5 to 3.7 mm. Average length 3.6 mm.

Head and pronotum as in other members of the genus. This species differs from all other members of the genus in having a much larger black spot on elevated apex of scutellum than occurs in the other forms. Tegmina milky-white to creamy-yellow. Crossband I bright red, somewhat narrowed near costal margin; crossband 2 not present or at most indistinct; oblique band at tip of abdomen dusky in color, wider than in other members of the genus; a dusky triangular spot on corium near claval suture just cephalad of cross veins; dots and flecks on clavus and corium bright red in color. The members of this species are as a rule, larger than the members of the other species of this genus.

Holotype, male, Coconino County, Arizona. Taken by R. H. Beamer.

Allotype, female, Coconino County, Arizona. Taken by R. H. Beamer.

Numerous paratypes from Arizona. All types in Snow Entomological Collection.

Hymetta kansasensis sp. n.

(Pl. I, fig. 7; Pl. II, figs. 2, 2a)

Length 3.2 to 3.4 mm. Average length 3.3 mm.

Head as in other members of the genus. Disc of pronotum usually darkened and finely granular. Scutellum with small black spot at apex. Tegmina milky-white marked as follows: a brownish to reddish transverse band extending across clavus just caudad of scutellum running obliquely to in front of costal plaque, a dark zigzag line running through plaque back to thin reddish band across transverse vein, a distinct dark oblique band across apical cells, a black dot on corium touching claval suture, small brownish spot on clavus caudad of these, and small scarlet flecks on corium, clavus and costal plaque cephalad of transverse veins.

Holotype, female, Douglas County, Kansas. Taken by P. B. Lawson.

Allotype, male, Bourbon County, Kansas. Taken by E. P. Breakey.

Paratypes, Doniphan and Atchison counties, Kansas. Taken by R. H. Beamer.

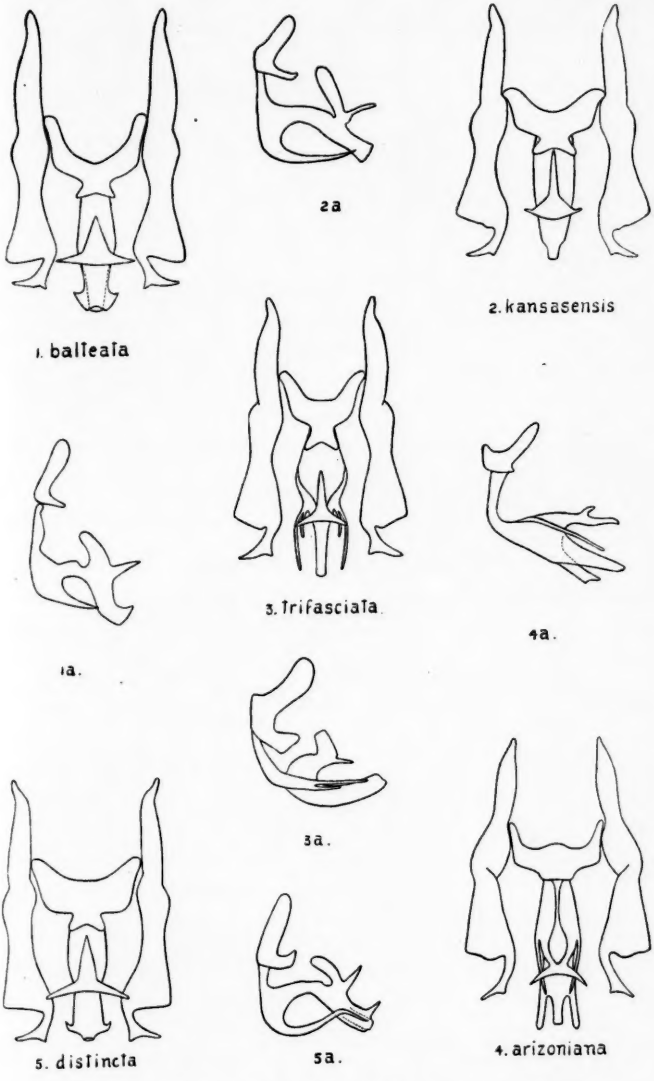

Plate I—Internal male genitalia of Hymetta.

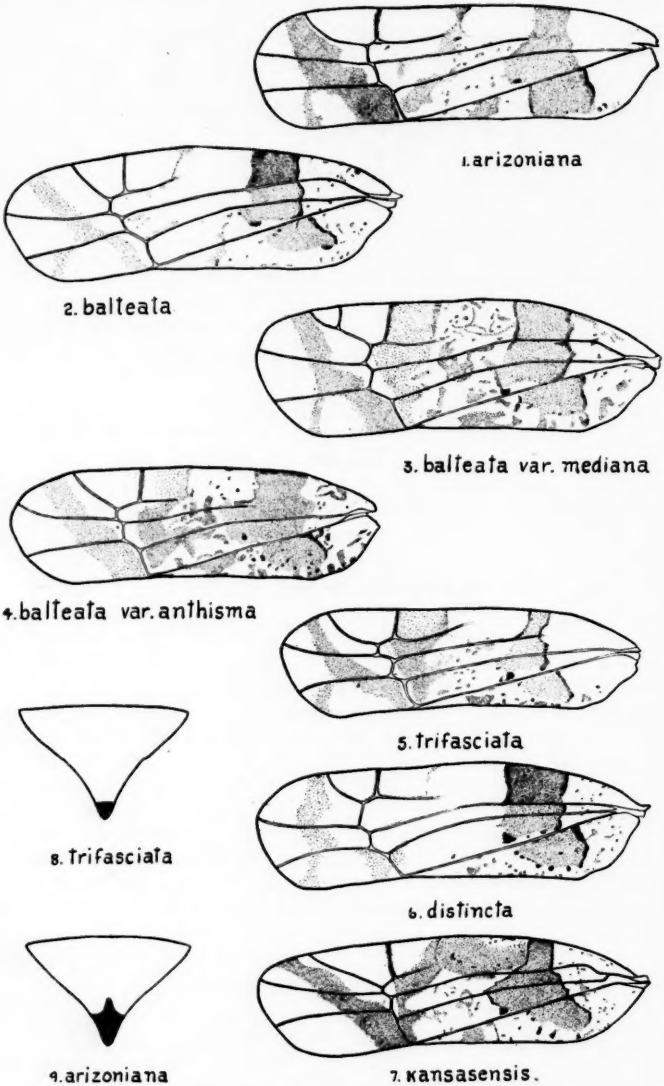

Plate II—Wings and scutella of Hymetta.

THE MUTILLIDAE OF KANSAS

Compiled by J. W. McColloch.

The recent publications by Mickel (1928) on the genus Dasymutilla, together with a previous paper (Mickel, 1924) on the genus Myrmilloides and Pseudomethoca list 184 species and varieties of Mutillidae occurring in America, north of Mexico. Forty-nine of these species and varieties are recorded from Kansas together with notes on local distribution and dates of appearance. Since the Kansas records of this interesting family are very limited, it has seemed advisable to compile the following list from these papers. Dr. Mickel had most of the specimens in the collections of the University of Kansas and the Kansas State Agricultural College for study. Many types and paratypes of Kansas species are deposited in the University and College collections and this information is given in the accompanying list. A few accession notes are also added from specimens in the collection of the Kansas State Agricultural College. Thanks are due Dr. Mickel for permission to compile this list from his papers.

MYRMILLOIDES Andre

M. **grandiceps** (Blake). Riley and Wallace counties, July-August.

PSEUDOMETHOCA Ashmead.

P. **canadensis** (Blake). Sandhills along Kansas River in Riley County. May-October.

P. **contumax** (Cresson). Gove and Wallace Counties. July.

P. **oceola** (Blake). Wabaunsee, Riley, Rush, Clark, and Meade Counties. June-September. A male was collected on **Euphorbia marginata** at Manhattan.

P. **paludata** Mickel. Morton County. Paratype in University of Kansas collection.

P. **simillima** (Smith). Neosho, Pottawatomie, Riley, Saline, Phillips, and Sheridan Counties. April-August.

P. **sanbornii** (Blake). Johnson and Franklin Counties. July.

P. **propinqua** (Cresson). Apparently state wide.

Wabaunsee, Riley, Russell, Rooks, Ellis, Rush, Kiowa, Norton, Clark, Decatur, Sheridan, Meade, Rawlins, Grant, Cheyenne, Wallace, Greeley, Hamilton, Stanton, and Morton Counties. June-August. Plesiotype in University of Kansas collection.

DASYMUTILLA Ashmead.

D. **harmonia** (Fox). State wide distribution. Douglas, Franklin, Wabaunsee, Riley, Sumner, Reno, Russell, Rooks, Rush, Comache, Norton, Gove, Meade, Rawlins, Logan, Cheyenne, Wallace, and Hamilton Counties. May -October.

D. **asopus** (Cresson). Riley, Pratt, Meade, and Scott Counties. June-September.

D. **hector** (Blake). Riley, Rooks, Lane, Cheyenne and Sherman Counties. August. Blake (1871) described this species from Kansas and the type is in the collection of the American Entomological Society.

D. **montivagoides** (Viereck). Viereck (1906) described this species from Hamilton County and the type is in the collection of the University of Kansas.

D. **nigricauda** (Viereck). This species was described by Viereck (1906) from Clark County and the type is in the University of Kansas collection. Also, occurs in Meade County. June-July.

D. **fulvohirta** (Cresson). Western Kansas species. Mitchell, Reno, Phillips, Norton, Graham, Ness, Clark, Gove, Logan, Grant, Cheyenne, Wallace, Hamilton, and Morton Counties. June-August.

D. **sparsa** (Fox). Johnson, Franklin, Riley, Russell, Phillips, Rooks, Ellis, Norton, Sheridan, Rawlins, Cheyenne, Sherman, and Hamilton Counties. June-September.

D. **sparsa** var. **segregata** Rohwer. This variety has been taken on sandhills at Manhattan and Medora. August.

D. **texanella** Mickel. Western Kansas. Logan, Scott, Wichita, Greeley, Hamilton, and Morton Counties. August.

D. macra (Cresson). Franklin, Riley, Decatur, Meade, Rawlins, Finney, Seward, Cheyenne, and Sherman Counties. June-August.

D. stevensi Mickel. Riley, Greeley, and Morton Counties. July-September. Paratypes are deposited in the collections of the University of Kansas and the Kansas State Agricultural College.

D. medora Mickel. Riley and Hamilton Counties. July-August. Paratypes in the collection of the Kansas State Agricultural College.

D. vesta (Cresson). Statewide distribution. Douglas, Franklin, Pottawatomie, Riley, McPherson, Reno, Sumner, Osborne, Russell, Barton, Phillips, Rooks, Ellis, Rush, Kiowa, Norton, Graham, Trego, Ness, Clark, Sheridan, Lane Finney, Meade, Rawlins, Thomas, Logan, Scott, Seward, Grant, Cheyenne, Sherman, Wallace, Greeley, Hamilton, Stanton, and Morton Counties. May-September.

D. vesta var. **errans** Rohwer. Riley, Barton, Phillips, Kiowa, Graham, Clark, Sheridan, Rawlins, Logan, Seward, Grant, Stevens, Wallace, Hamilton, Stanton, and Morton Counties. June-August.

D myrice Mickel. Described from Grant County. Also, occurs in Osborne, Russell, Rooks, Comanche, Norton, Gove, Meade, Seward, Hamilton, Stanton, and Morton Counties. July-September. Holotype in the collection of the University of Kansas. Paratypes in the collections of the University of Kansas and the Kansas State Agricultural College.

D. bioculata (Cresson). Statewide distribution. Douglas, Pottawatomie, Riley, Sedgwick, Mitchell, Reno, Phillips, Rooks, Graham, Trego, Decatur, Gray, Meade, Cheyenne, Wallace, and Morton Counties. May-September.

D. creusa (Cresson). A western Kansas species. Pratt, Ellis, Comanche, Norton, Graham, Trego, Clark, Gove, Meade, Scott, Seward, Rawlins, Logan, Wichita, Grant, Cheyenne, Sherman, Wallace, Hamilton, Stanton, and Morton Counties. June-September.

D. creusa var. **bellona** (Cresson). Riley, Mitchell, Rooks, and Wallace Counties. July-September.

D. ursula (Cresson). Wallace County.

D. quadriguttata (Say). Statewide distribution. Cherokee, Douglas, Franklin, Allen, Neosho, Pottawatomie, Riley, Geary, Reno, Phillips, Kiowa, Comanche, Norton, Clark, Decatur, Stevens, Cheyenne, Sherman, Wallace, and Morton Counties. May-September.
Hayes (1924) reared this species from the cocoon of **Elis quinquecincta,** collected in Riley County.

D. interrupta Banks. Cherokee, Douglas, Franklin, Riley, Russell, Phillips, Clark, Sheridan and Rawlins Counties. May-October.

D. atrifimbriata Mickel. Riley County. August. Paratype in Kansas State Agricultural College collection.

D. biguttata (Cockerell). This species has been taken in sandhills at Manhattan and Medora. August-September.

D. curticeps Mickel. Described from Comanche County. Holotype in the collection of the University of Kansas.

D. nitidula Mickel. Rooks, Clark, Seward, and Grant Counties. July-August. Paratypes in the University of Kansas and the Kansas State Agricultural College collection.

D. anguliceps (Fox). Sandhills at Manhattan, July.

D. campanula Mickel. Described from a female collected in Greeley County. Holotype in the collection of the University of Kansas.

D. permista Mickel. Distribution statewide. Cherokee, Douglas, Franklin, Anderson, Labette, Riley, Sumner, Osborne, Russell, Rooks, Ellis, Kiowa, ,Comanche, Trego, Clark, Decatur Meade, Rawlins, Finney, Cheyenne, Wallace, and Stanton Counties. July-August. Paratypes in collection of the Kansas State Agricultural College. Hayes (1924) reared this species from the cocoon of **Elis quinquecincta** collected in Riley County.

D. meracula Mickel. This species was described from a male collected in Comanche County. Also, occurs in Seward County. August. Holotype and paratypes in University of Kansas collection.

D. caneo (Blake). Kiowa, Lane, Grant, Stanton, and Morton Counties. July-August.

D. birkmani (Melander). Riley, Phillips, Graham and Wallace Counties. June-August.

D. monticola (Cresson). Western Kansas. Kiowa, Meade, Wichita, Grant, Wallace, Hamilton, Stanton and Morton Counties. June-July.

D. reclusa Mickel. Riley, Reno, Kiowa, Clark, Finney, Hamilton, and Morton Counties. June -August. Paratypes are in the collections of W. Knaus, the University of Kansas and the Kansas State Agricultural College.

D. occidentalis var **comanche** (Blake). Distribution statewide. Douglas, Franklin, Allen, Neosho, Wabaunsee, Riley, Butler, Saline, Sumner, Reno, Kingman, Russell, Pratt, Phillips, Rooks, Graham, Decatur, Sheridan, Seward, Cheyenne, Wallace, Hamilton, and Morton Counties. June-September. Males have been taken on **Euphorbia marginata** and **Solidago sp.** in Riley County.

D. calorata Mickel. Comanche County. Paratypes in University of Kansas collection.

D. klugii (Gray). Medora sandhills in Reno County.

D. leda (Blake). Common throughout Western Kansas. Reno, Osborne, Russell, Phillips, Rooks, Kiowa, Comanche, Norton, Graham, Clark, Gove, Meade, Logan, Seward, Grant, Wallace, Greeley, Hamilton, Stanton, and Morton counties. May-September. The type of **Mutilla prognoides** Viereck, a synonym, is in the University of Kansas Collection.

D. obscura (Blake). Wabaunsee, Riley, Trego, Clark, Decatur, Sheridan, Lane, Cheyenne, Sherman, Wallace, and Greeley Counties. June-September. The type of **Mutilla (Dasymutilla) apachea** Viereck, a synonym, is in the collection of the University of Kansas.

D. poecilonota (Melander). Grant County. July.

D. bollii (Fox). Neosho and Labette Counties. June.

D. perilla var. **gentilicia** Mickel. Described from Wallace County. July. The holotype is in the collection of the Kansas State Agricultural College.

LITERATURE CITED.

Blake, C. A.—Synopsis of the Mutillidae of North America.
Trans. Amer. Ent. Soc. 3:217-265. 1871.

Hayes, W. P.—Two Mutillids Hyperparasistic on White Grub.
Bull. Brook. Ent. Soc. 19:153. 1924.

Mickel, C. E.—A Revision of the Mutillid Wasps of the Genera Myrmilloides and Pseudomethoca. Occurring in America, north of Mexico. Proc. U. S. Nat. Mus. 64:1-51. 1924.

Mickel, C. E.—Biological and Taxonomic Investigations on the Mutillid Wasps. U. S. Nat. Mus. Bull. 143. pp. 351. 1928.

Viereck, H. L.—Notes and Descriptions of Hymenoptera from the Western United States. Trans. Amer. Ent. Soc. 32:173-247. 1906.

COLLECTING NOTES ON COLEOPTERA

W. KNAUS, McPherson, Kans.

The collecting season of 1928 in the Medora Sand Hill Region of Reno County Kansas was unusual, due no doubt, to the great quantities of rain that fell during May and June, and to the late season; which was ten days later than normal seasons. Water covered the bottoms of all large "blow outs", all the medows in the small valleys had running streams, and ponds of rain water were numerous.

My collecting was restricted to Coleoptera, and principally to lantern and sheet work at night.

Scarabeidae, as a rule were not at all numerous in species or specimens. **Phyllophaga,** which are usually abundant from June 20 to July 15, were very few in number, at least two species, **gracilis** (Burm.) and

submucida Lec., not coming to light.

Longitarsus (Say). **bipartita** Horn. **rugosa** (Melsh.) and **crassissima** (Blanch.) were taken only in very small numbers, when usually such species as **longitarsus** (Say) could be taken by the hundreds in a single evening.

Diazus rudis Lec. occurred sparingly the middle of July. Only one or two specimens of **Anomala ludoviciana** Schffr. were picked up the 13th of July, and no **Strigodermella knausi.** Brown were seen though they were numerous the two seasons previously.

Anomala flavipennis Brum., and its variety **modulata** Csy., were taken sparingly at light, although usually they are very numerous.

The rare **Glaresis knausi** Brown, was especially numerous on the evening of July 13—forty specimens coming to light—more than I had ever taken altogether for the past three seasons.

Odentaeus filicornis (Say), always rare, only yielded two specimens this season ot light. It has never been found in its burrow in this region.

Ochodaeus kansanus Fall, was also very numerous on the evening of July 13, some fifty or sixty specimens being taken. On the same evening several specimens of **Bolboceras fossatus** (Hald.) were taken at light, as were a few specimens of **Polyphylla hammondi** Lec.

On July 13 and 14 two **Enoclerus spinolae** Lec. were taken on Yucca pods, although the previous season they were numerous.

The large brown **Elaterid, Agrypnus sallei** Lec. were taken at light, a half dozen speciemens appearing on the evening of September 14. On September 22nd another speciemen was taken under a decaying watermelon.

A fall brood of the handsome **Cicindela lengi W.** Horn appeared in September, specimens being taken on September 14 and 22.

The vegetation in the Sand Hill region this season was extremely luxurient—grass reaching a height of six feet and Sunflowers much higher.

NOTES.

Insect Fossil Beds—The Popenoe Entomological Club of the Kansas State Agricultural College, held a field meeting at the insect fossil beds near Elmo, Kansas,

on August 27. About thirty people were in attendance, including the following entomologists: Dr. R. J. Tillyard, Canberra, Australia; Dr. F. Muir, Honolulu, Hawaii; Dr. W. Knaus, McPherson, Kansas, and G. A. Dean, J. W. McColloch, R. L. Parker, R. H. Painter, Gilbert Schenck, H. R. Bryson, S. A. Summerland, G. E. Marshall, and S. A. Kelly, Manhattan, Kansas. A number of excellent specimens were obtained, some of which are new to science.

ANNOUNCEMENT

This issue brings to a close Volume I of the Journal of the Kansas Entomological Society. The response to this journal has been very gratifying, as evidenced by the increasing subscription list. As a result, the supply of back numbers is rapidly being exhausted and it is necessary to increase the price of Volume I to $1.50. New subscribers to Volume II, however, may obtain Volume I at the $1.00 rate, providing their subscription is received before January 1, 1929.

Volume 1, Number 4, October 1928. Mailed October 2nd.

VOL. I. 1928 INDEX

Journal

OF THE

Kansas Entomological Society

PUBLICATION COMMITTEE

P. B. LAWSON, Chairman, Lawrence
J. W. McCOLLOCH, Editor, Manhattan H. H. NININGER, McPherson
W. KNAUS, McPherson HAZEL E. BRANCH, Wichita

Contents Page

Index 102
Errata 103

JOURNAL OF THE
KANSAS ENTOMOLOGICAL SOCIETY

Publication Office, 119 South Main Street, McPherson, Kansas,
W (arren) Knaus, Publisher

A quarterly journal published in January, April, July and October, devoted to entomology in Kansas and to the proceedings of the Kansas Entomological Society.

The subscription price is one dollar a year payable in advance. Single copies may be had at forty cents.

Manuscripts for publication may be sent to any one of the publication committee.

Subscriptions should be sent to the office of Publication, 119 South Main Street, McPherson, Kansas.

Entered as second-class matter December 31, 1927 at the Post-Office at McPherson, Kansas, under the Act of August 24, 1912.

INDEX*

Agrypnus sallei LeConte 44
Arthropoda, list of literature on Kansas 3
Ashton, T. B., letter from 19

Bruce, W. G., article by 74
Burt, C. E., article by 50

Cicadellidae 79, 84
Coccinellidae of Kansas 26
Coleoptera 26, 43, 44, 98
Collecting notes on Coleoptera 98
Constitution of the Kansas Entomological Society .. 71

Dispersal of Scarabaeids by flood waters 43
Domestic animals, use of Volck on 74

Erythroneura ziczac Walsh, life history of 79
External parasites of domestic animals 74

Fairbairn, V. M., articles by 79, 84
Feeding habits of Kansas lizards 50

Genus Hymetta 84
Gui, H. L., article by 26

Homoptera 79, 84
Household pest, Lasius interjectus as a 38
Hymenoptera 38, 93
Hymetta (Homop. Cicadellidae) 84

Insect food of Kansas lizards 50
Insects, literature of Kansas 3

Kansas Entomological Society, Constitution 71
Kansas Entomological Society, Proceedings .. 24, 46, 68
Knaus, W., articles by 19, 44, 98

Lady bird beetles of Kansas 26
Lasius interjectus Mayr, a household pest 38
Letter from a pioneer Kansas entomologist 19
Life history of Erythroneura ziczac Walsh 79
List of literature of Kansas Arthropoda 3
Literature on Kansas Arthropoda 3
Lizards, insect food of 50

*See Correction in Regard to Paging of Number 2 in Errata.

McColloch, J. W., articles by 3, 43, 93
Mutillidae of Kansas 93

Northward extension of Agrypnus sallei 44

Pioneer Kansas entomologist, letter from 19
Proceedings of the Kansas Entomological Society 24, 46, 68

Scarabaeids, dispersal by flood waters 43
Smith, Roger C., article by 38

Velvet ants of Kansas 93
Volck for control of external parasites of animals .. 74

ERRATA

Page 16, line 39—delete "Lists 299 species from Kansas".

Page 20, lines 37 and 40—'13st", should read 13 St.

Page 21, line 9—"he" should be "I".

The paging of the April issue (No. 2) should have been from 25 to 48, the cover page being 25.

Page 34, line 27—delete "en-".

Page 44, line 29—"sunus" should be "sinus".

Page 44, line 33—"Museary" should be "Museum"

Page 60, line 32—"Crematogaster" should be "Cremastogaster".

Page 75, line 38—**"obdominalis"** should be **"abdominalis".**

Page 82, line 16—"Nyphal" should be "Nymphal".

Page 91—"Plate I" should be "Plate II".

Page 92—"Plate II" should be "Plate I".

Page 98, line 32—"Medows" should be "Meadows".

Page 99, line 18—"Odentaeus" should be "Odontaeus"